

# Stanford CS Course Placement Information

Based on a handout by Eric Roberts, Mehran Sahami, and others.

Learning to program computers unlocks the full power of computer technology in a way that is both liberating and exciting. At the same time, programming is an intellectually challenging activity that comes easily to very few people. Taking a programming course requires a great deal of work and commitment on your part, but you will not be able to master programming without putting in that level of work somewhere along the way. The payoffs, however, are quite real. If you make the effort and keep up with the demands of the material, you will be able to make computers do amazing things. As you begin your journey in computing at Stanford, it would serve you well to decide what are the best options for you along this route.

## What introductory programming course should I take?

A very large percentage of Stanford students take a programming course from the Computer Science Department at some point during their undergraduate career. Because we need to accommodate students with a wide range of backgrounds and interests, the CS department offers several different introductory classes:

- *CS 101—Introduction to Computing Principles* and *CS 105—Introduction to Computing*. These courses are designed as a general-education introduction to what this rapidly expanding field of computer science is all about. They attract an audience of approximately 300 students a year, most of whom take the courses primarily to meet the “Formal Reasoning” Ways of Thinking/Doing requirement. If your only interest is in meeting that requirement, CS101 or CS 105 is likely to be the most appropriate course. Like any programming courses, both CS101 and CS 105 requires a reasonable amount of work, but not as much as CS 106A. CS 101 is offered in Spring quarter, and CS 105 is offered in Autumn quarter this year.
- *CS 106A—Programming Methodology*. This course is the largest of the introductory programming courses and is one of the largest courses at Stanford (taken by roughly 1,500 students last year). CS106A teaches the widely-used Java programming language along with good software engineering principles. The course is explicitly designed to appeal to humanists and social scientists as well as hard-core techies. In fact, most CS 106A graduates end up majoring outside of the School of Engineering. The course requires no previous background in programming, but does require considerable dedication and hard work. CS106A is offered in Autumn, Winter, and Spring quarter this year.

Note: this year, there are a few different versions of CS106A being offered. The “classic” version of CS106A (described above) is taught in Java and is offered with unlimited enrollment in Autumn, Winter, and Spring quarter this year. To enroll in this version of the class on Axess, you should enroll in CS106A, [Section 1](#).

There is also a new version of CS106A, called “CS106AJ”, offered only in Autumn quarter that covers the same conceptual material as the classic CS106A course but

uses the JavaScript language (rather than Java). CS106AJ is a limited enrollment class, and at the time of this writing, the class is already full. In the unlikely event that space becomes available in that class (i.e., some currently enrolled students drop the class) and you wanted to enroll, you would enroll in CS106A, Section 2.

In Winter and Spring quarter this year, another version of CS106A, known as “CS106AP” will also be offered. Again, this class covers the same conceptual material as the classic CS106A course but uses the Python language. CS106AP will have limited enrollment in the Winter quarter offering, but will have unlimited enrollment in Spring quarter. To enroll in CS106AP (in a Winter or Spring quarter), you would enroll in CS106A, Section 3.

- *CS 106B—Programming Abstractions.* This course is the natural successor to CS 106A and covers such advanced programming topics as recursion, algorithmic analysis, and data abstraction using the C++ programming language, which is similar to both C and Java. If you've taken the AP Computer Science A (not the CS Principles) exam and done well (scored 4 or 5) or earned a good grade in a college course, CS106B may be an appropriate course for you to start with, but sometimes CS106X may be a better choice. CS106B assumes that you already have familiarity with good programming style and software engineering issues (at the level of CS106A), and that you can use this understanding as a foundation on which to tackle new topics in programming and data abstraction. CS106B is offered in the Autumn, Winter, and Spring this year.
- *CS 106X—Programming Abstractions (Accelerated).* CS106X currently operates as an "honors" version of our CS106B course. It is taught using the C++ programming language and covers the same topics as CS106B but with more in-depth coverage in some areas. In order to get through that much material in a quarter, CS 106X moves at a very fast pace. Students are expected to have solid background comparable to our CS106A course, and should have sufficient maturity and dedication to tackle an intense challenge. If you've had previous programming experience, this class is an excellent way to learn C++ and brush up on your skills. If you haven't done much programming before or don't feel comfortable with your programming skills, you should take the CS 106A/B sequence instead. Don't let anyone tell you that “real engineers take CS 106X.” These days, most computer scientists and engineers (which would also include your current CS106A instructor when he was in your shoes) start with CS 106A, where they do just fine. The last thing you want to do is get in over your head. If you think you are ready for CS106X, you might want to see how you feel about the course expectations and pace after attending the first few classes. CS 106X is offered in Autumn and Winter quarters this year. Note that the Winter quarter offering of CS106X this year will have limited enrollment and assignments in the course will be based in CS department research.

Note: Students who have previously taken CS106A and wish to enroll in CS106X in place of CS106B are free to do so. You just need be prepared for a fast paced course.

### **I already know how to program—shouldn't I skip the intro courses altogether?**

Many students entering Stanford today have had considerable programming experience in high school or from their own independent work with computers. If you are in that position, the idea of starting with a beginning programming course—even an intensive one like CS 106X—seems like a waste of time. Your perception may in fact be correct. In my experience, there are at somewhere between 10 and 15 students in each entering class who should start at a more advanced point in the sequence. For most of you, however, the right place to start is with the CS 106 series. Most high-school computing courses are quite weak and provide very little background in modern software engineering techniques. By taking CS 106, you will learn how the CS department at Stanford approaches programming and get a solid foundation for more advanced work. If you're unsure where you should start the programming sequence, please talk with me.

### **Other courses**

As computers become more powerful, it is possible to use them for increasingly sophisticated tasks without engaging in programming, at least in a traditional sense. The CS 106 courses teach you about programming, and not just about a particular programming language.

If your goal is knowing more about how to use computers, you should investigate the following course:

- *CS 1C—Introduction to Computing at Stanford.* This one-unit course is offered in the Autumn quarter only and makes sure you have a level of “computer literacy” that will allow you to function effectively at Stanford. It does not teach programming at all.

If, on the other hand, you already have programming experience and want to learn about specific languages and tools, you should check out the following courses:

- *CS 142—Web Applications.* This course covers the concepts and techniques used in constructing interactive web applications, including the JavaScript. It requires prior programming experience at the level of CS107 and CS108. It will be offered in Autumn and Spring quarters this year.
- *CS 193C—Client-Side Internet Technologies.* This course covers such client-side web-oriented topics as JavaScript, HTML5, CSS, and Ajax. The course requires previous programming experience at the level of CS106A. It will likely only be offered during Summer quarter this year.
- *CS 193P—iOS Application Programming.* As the name implies, this course charts the development path for iPhone and iPad applications. It requires prior programming experience (prerequisites: CS107 or CS108 as well as familiarity with the C programming language). It will be offered during Autumn and Winter quarters this year.